Annals of Physics 388 (2018) 267–275

Contents lists available at ScienceDirect

Annals of Physics

journal homepage: www.elsevier.com/locate/aop

Reconstruction of slow-roll $F(R)$ gravity inflation from the observational indices

S.D. Odintsov [a,b,c], V.K. Oikonomou [d,e,f,*]

[a] ICREA, Passeig Luis Companys, 23, 08010 Barcelona, Spain
[b] Institute of Space Sciences (IEEC-CSIC), C. Can Magrans s/n, 08193 Barcelona, Spain
[c] Institute of Physics, Kazan Federal University, 420008 Kazan, Russia
[d] Department of Physics, Aristotle University of Thessaloniki, Thessaloniki 54124, Greece
[e] Laboratory for Theoretical Cosmology, Tomsk State University of Control Systems and Radioelectronics (TUSUR), 634050 Tomsk, Russia
[f] Tomsk State Pedagogical University, 634061 Tomsk, Russia

ARTICLE INFO

Article history:
Received 8 October 2017
Accepted 19 November 2017
Available online 22 November 2017

Keywords:
$F(R)$ gravity
Modified gravity
Inflation
Early universe

ABSTRACT

In this work, we introduce a bottom-up $F(R)$ gravity reconstruction technique, in which we fix the observational indices and we seek for the $F(R)$ gravity which may realize them. Particularly, as an exemplification of our method, we shall assume that the scalar-to-tensor ratio has a specific form, and from it we shall reconstruct the $F(R)$ gravity that may realize it, focusing on special values of the parameters in order to obtain analytical results. The observational indices we study are compatible with the latest observational data, and we discuss how the functional form of the observational indices may affect the viability of the model.

1. Introduction

Describing the inflationary era [1–4] in a consistent way is unarguably one of the streamline tasks of modern cosmology. Lately, considerable effort is given in describing the early-time acceleration era by using modified gravity in its various forms [5–8], with $F(R)$ gravity having a prominent role among all modified gravities. The $F(R)$ gravity framework is a concise and appealing theoretical framework, which in conjunction with the simplicity, renders $F(R)$ gravity one of the most important theories of modified gravity. In addition, the latest Planck data [9] and also the BICEP2/Keck-Array data [10],

* Corresponding author at: Laboratory for Theoretical Cosmology, Tomsk State University of Control Systems and Radioelectronics (TUSUR), 634050 Tomsk, Russia.
E-mail addresses: odintsov@ieec.uab.es (S.D. Odintsov), voiko@physics.auth.gr (V.K. Oikonomou).

https://doi.org/10.1016/j.aop.2017.11.026
0003-4916/